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EXPERIMENTAL AND IN VIVO STUDIES OF THE TOXICITY OF A GROUP OF PHTALATE PLASTICIZERS

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EXPERIMENTAL AND IN VIVO STUDIES OF THE TOXICITY OF A GROUP OF PHTALATE PLASTICIZERS. [Eksperimental'nyye i natural'nyye issledovaniya toksichnosti gruppy ftalatnykh plastifikatorov.]

by

L. A. Timofiyevskaya and M. V. Aldyreva
Institute of Industrial Hygiene and Occupational Diseases of the USSR Academn of Medical Sciences, Moscow.

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The development of modern chemistry is oriented toward the production of a number of synthetic materials, rubbers, resins, leathers, varnishes paints,plastics,etc.

Phtalate plasticiters are widely used as auxiliary substances in the production of macromolecular compounds and synthetic substances. For example, in the production of artificial leather, large amounts of various chemical compounds are used in the form of suspensions of powdery substances

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in plasticiters. The main components of these mixtures are: Plasticiters with a phtalic acid base and stabilizing agents. These mixtures are subjected to treatment on roll mills, calender machines and other equipment, at a temperature in the 75 - 250°C range, depending on the production process.

Analyses of the air made to determine the concentrations of various toxic compounds used in the mix formulas, have shown that phtalate plasticiters occupy a leading position among them (1-10 mg/m^3). The highest concentrations were determined at the work sites of the roll mill operators, calender machine operators and coating machine operators.

Carbon monoxide, hydrogen chloride, vinyl chloride and also polyvinyl chloride resin dust, lead and cadmium compounds, were detected in small amounts in the air at the production areas along with the plasticiters. In addition, the air temperature in the production sites mentioned (in the vicinity of the roll mills and calender machines) is higher during the operations, while the physical stress varies.

The studies made in the Institute established that phtalate plasticiters are the principal harmful factors causing polyneuritis, myeloneuritis and encephalic polyneuritis among the workers (Milkov et al., 1969). The seriousness of the diseases is directly proportional to the length of service, the occupation and the concentration level of the phtalate plasticiters at the work sites. The toxicity of a group of phtalate plasticiters (dimethyl-, diethyl-, dibntyl- and dioctyl phtalates) along the various paths through which they enter the organism was investigated along with the studies made in vivo in the plant.

The studies established that the inhalation of phtalate plasticiter vapors under normal pressure and temperature does not cause fatal poisonings. The LD 50 is in the range from 8.2 g/kg (dimethyl phtalate) to 37 g/kg (dioctyl phtalate), when it is introduced into the stomach. The specific and sexual sensitivity of the animals is not pronounced when plasticiters are introduced into the stomach.

Application to the skin (single and chronic) does not cause local irritation and it is not accompanied by a cutaneous resorption effect. Repeated intorduction of phtalates in doses equal to 1/5, 1/10 and 1/20 of the lethal dose (DL 50) demonstrated the presence of a pronounced cumulative effect. The cumulative concentration level lies in the range from 1.01 g/kg (dioctyl phtalate) to 2.9 g/kg (dimethyl phtalate). Prolonged daily inhalation (5 hours for a period of 4 months) of the first member of the series, dimethyl phtalate, in 2 mg/m^3 and 0.5 mg/m^3 concentrations, led to chronic poisoning with functional disturbances in the nervous system, liver and peripheral blood.

The recommended tentative maximum permissible dimethyl phtalate concentration is 0.2 - 0.1 mg/m^3.